

**Condensed Title:**

A resolution of the Mayor and City Commission of the City of Miami Beach, Florida, approving a roadway configuration for 16<sup>th</sup> Street from Alton Road to Lenox Court that consists of no parking on the north side, parking on the south side, two travel lanes, a left turn lane, and bike lanes, which was presented at the Neighborhoods/Community Affairs Committee on January 21, 2009.

**Key Intended Outcome Supported:**

Improve or maintain traffic flow.

**Supporting Data (Surveys, Environmental Scan, etc.):** Transportation remains one of the most significant areas to address from the survey results (often mentioned as a key quality of life issue). 24% of residents rated traffic flow excellent or good, and 37% as poor. 35% of residents rated the availability of pedestrian trails and bicycle paths/lanes as excellent or good, and 30% as poor.

**Issue:**

Shall the City Commission adopt the Resolution?

**Item Summary/Recommendation:**


In September 2007, the Public Works Department striped and signed bike lanes on 16<sup>th</sup> Street between Bay Road and Washington Avenue. This required the removal of a left turn lane on 16<sup>th</sup> Street approaching Alton Road westbound. After the implementation of the bike lanes, residents complained to elected officials and City staff that the elimination of the left turn lane resulted in a significant back-up of vehicles. City staff was directed by the Office of the Mayor and Commissioners to address this issue. The City retained the services of PBS&J to perform a qualitative analysis of the operational conditions of the existing intersection with bike lanes and the results of the study concluded that a queue on the westbound direction was caused by left turn vehicles blocking the westbound through movement. An option to improve this condition would be to introduce a left turn lane on 16<sup>th</sup> Street at Alton Road; however doing so would require either the elimination of the bike lane or elimination of the on-street parking on the north side of 16<sup>th</sup> Street between Alton Road and Lenox Court. At the November 24, 2008 Neighborhoods/Community Affairs Committee meeting, a motion was made to remove the five (5) existing parking spaces on the north side of 16<sup>th</sup> Street from Alton Road to Lenox Court to allow sufficient space for both the bike lane and a dedicated left turn lane. A relatively high number of bicyclists utilize 16<sup>th</sup> Street, since it provides directness and connectivity to bicycle traffic generators. The existing bike lanes provide a safer environment for these bicyclists, since the bike lanes minimize potential conflicts between them and motorized vehicles either parallel parked on 16<sup>th</sup> Street or traveling through the intersection of 16<sup>th</sup> Street at Alton. City staff met with Miami-Dade County on December 15, 2008 to discuss the intersection and the proposed roadway configuration received preliminary approval. At the January 21, 2009 Neighborhoods/Community Affairs Committee meeting, a motion was made to approve a proposed cross-section of no on-street parking on the north side, on-street parking on the south side, two travel lanes, a left turn lane, and bike lanes.

**ACCEPT THE CITY MANAGER'S RECOMMENDATION.**

**Advisory Board Recommendation:**

N/A

**Financial Information:**

Source of Funds:		Amount	Account
 OBPI	1		
	2		
	3		
	Total		

**Financial Impact Summary:****City Clerk's Office Legislative Tracking:**

Fernando Vazquez, P.E., ext. 6399

**Sign-Offs:**

Department Director	Assistant City Manager	City Manager
RCM _____	RCM 	JMG 

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## COMMISSION MEMORANDUM

TO: Mayor Matti Herrera Bower and Members of the City Commission

FROM: City Manager Jorge M. Gonzalez

DATE: February 25, 2009

SUBJECT: **A RESOLUTION OF THE MAYOR AND CITY COMMISSION OF THE CITY OF MIAMI BEACH, FLORIDA, APPROVING A ROADWAY CONFIGURATION FOR 16<sup>TH</sup> STREET FROM ALTON ROAD TO LENOX COURT THAT CONSISTS OF NO PARKING ON THE NORTH SIDE, PARKING ON THE SOUTH SIDE, TWO TRAVEL LANES, A LEFT TURN LANE, AND BIKE LANES, WHICH BEST SUPPORTS THE GOALS ESTABLISHED IN THE APPROVED 16<sup>TH</sup> STREET OPERATIONAL IMPROVEMENT AND ENHANCEMENT PROJECT BASIS OF DESIGN REPORT AND WHICH WAS PRESENTED AT THE NEIGHBORHOODS/COMMUNITY AFFAIRS COMMITTEE ON JANUARY 21, 2009.**

### **ADMINISTRATION RECOMMENDATION**

Adopt the Resolution.

### **BACKGROUND**

A Basis of Design Report (BODR) was prepared for the 16<sup>th</sup> Street Operational Improvements and Enhancement project and subsequently reviewed and approved by the Commission on September 5, 2007. After existing base data for the project area was collected and analyzed, one of the goals identified in the conceptual design to minimize speeds along the corridor was traffic calming. It was indicated that traffic calming was a major missing element along the entire corridor as well as a primary recommendation for a pedestrian-friendly environment along 16<sup>th</sup> Street. The actual condition of the corridor, undivided with a wide right-of-way, was noted to encourage increased travel speeds. The wide roadway width meant that pedestrians were exposed to significant crossing distances. Sight distance was deficient and parked vehicles and signs obstructed pedestrian's views. Design recommendations included narrower lanes to reduce drive speeds, bulb outs at intersections to announce pedestrian crossings (and reduce pedestrian crossing distances) and special pavement crosswalks and parking lanes to designate these as special areas.

As part of the approved BODR some of the site design recommendations to create a more pedestrian-friendly environment included a street cross section consisting of a two 10-foot travel lanes, two 5-foot bike lanes, two 8-foot on-street parking lanes, two 12-foot sidewalks in the commercial zone between, Collins Avenue and Washington Avenue and between Alton Road and Lenox Avenue and 6- to 8-foot, variable-width sidewalks in the residential zone, between Lenox Avenue and Washington Avenue, with the planting areas next to private properties varying in width. See proposed cross-section identified in the BODR (Attachment 1, Proposed BODR Cross-sections for 16<sup>th</sup> Street).

The development of the BODR included an intensive public involvement process with substantial public input. The following chart summarizes the underlined preferences of various stakeholders:

	Decorative Stamped Asphalt	Bicycle Lanes	Wider Sidewalks	Enhanced Landscaping	Parking	Removal of Encroachments
Historical Preservation Board		■	•	•	•	•
Internal Visioning Session		■		•	•	
Community Workshop		■		•		
Transportation and Parking Committee		■	•	•		
Planning Board	•	■	•	•		•
Flamingo Neighborhood Association			•	•		
Finance and Citywide Projects Committee		■	•	•		•

As noted in this chart, almost every stakeholder group preferred bike lanes.

In September 2007, the Public Works Department striped and signed bike lanes on 16th Street between Bay Road and Washington Avenue. This required the removal of a left turn lane on 16<sup>th</sup> Street approaching Alton Road westbound. After the implementation of the bike lanes, some residents complained to elected officials and City staff that the elimination of the left turn lane resulted in a significant back-up of vehicles. City staff was directed by the Office of the Mayor and Commissioners to evaluate this issue further and determine the viability of these complaints.

## **ANALYSIS**

Pursuant to these complaints, the City retained the services of PBS&J to perform a qualitative analysis of the operational conditions of the existing intersection with bike lanes during the morning (7:00 a.m. to 9:00 a.m.) and afternoon (4:00 p.m. to 6:00 p.m.) peak hours in order to be able to provide an assessment of the existing roadway configuration (see Attachment 2, PBSJ Study). The results of the study provided the following conclusions based on field observations:

- The right turning vehicles on both directions used the bike lane to turn, forcing bicyclists to use the sidewalk.
- The stacking on the westbound direction was caused by left turn vehicles blocking the westbound through movement while they wait for an adequate gap from opposing traffic that crosses the intersection.

The study concluded that the current condition shows stacking for the westbound movement at the intersection. An option to improve this condition would be to introduce a left turn lane on 16<sup>th</sup> Street at Alton Road. Given the current street width, to introduce a dedicated left turn lane would require the removal of the 16<sup>th</sup> Street bike lanes from Lenox Avenue up to the intersection at Alton Road or the elimination of on-street parking in the same area.

An adverse effect to removing the bike lanes would be that the continuity of bike lanes would be truncated at Lenox Avenue and therefore would introduce a safety issue to bicyclists trying to reach Alton Road as it would force the bicyclists to use the sidewalk or to have to share the street with motorized vehicles crossing 16<sup>th</sup> Street at this intersection.

A relatively high number of bicyclists utilize 16<sup>th</sup> Street, since it provides directness and connectivity between major street collectors such as Alton Road to points of destination such as Washington Avenue and the beach as well as other points of interest in South Beach. The existing bike lanes provide a safer environment for these bicyclists, since the bike lanes minimize potential conflicts between them and motorized vehicles either parallel parked on 16<sup>th</sup> Street or traveling through the intersection of 16<sup>th</sup> Street at Alton.

To evidence this, bicycle counts were conducted at the intersection of 16<sup>th</sup> Street and Alton Road before and after the bike lanes were striped along 16<sup>th</sup> Street. Miami-Dade County conducted bicycle counts in February 2007. There were a total of 20 bicyclists counted on a weekday between the hours of 7-9am, and a total of 31 bicyclists on a Saturday between the hours of 12-2pm. The City of Miami Beach Public Works Department conducted bicycle counts after the bike lanes were striped in May 2008 during the same days and hours. The number of bicyclists increased on the weekday from 20 to 28 bicyclists, and on Saturday they increased from 31 to 121. This dramatic increase demonstrates how well the bike lanes are being utilized by the community, particularly during weekend hours for both transportation and recreational use. Table 1 below summarizes the before and after bicycle counts at 16<sup>th</sup> Street and Alton Road.

**Table 1. Bicycle Counts at 16<sup>th</sup> Street and Alton Road**

BEFORE		AFTER		
February 2007		May 2008		% Change
Weekday	20	Weekday	28	40%
Saturday	31	Saturday	121	290%

The City conducted additional bicycle counts in November 2008 for all turning movements along both Alton Road and 16<sup>th</sup> Street between the hours of 4-6pm. According to these counts, there were a total of 91 bicyclists traveling eastbound/westbound along 16<sup>th</sup> Street and a total of 105 bicyclists traveling northbound/southbound along Alton Road (see Attachment 3, 16<sup>th</sup> St. and Alton Rd. Bicycle Counts).

#### **NEIGHBORHOODS/COMMUNITY AFFAIRS COMMITTEE**

At the November 24, 2008 Neighborhoods and Community Affairs Committee meeting, a motion was made to remove the five (5) existing parking spaces on the north side of 16<sup>th</sup> Street from Alton Road to Lenox Court. The Committee deemed that the available right of way can only support two out of three possible uses and that the turn lane and bike lane were higher priority than the parking spaces. This option would allow sufficient space for both the bike lane and a dedicated left turn lane. At the December 10, 2008 City Commission Meeting, the City Commission referred this item to the next Neighborhoods and Community Affairs Committee meeting for additional discussion.

Subsequent to the December 10<sup>th</sup> City Commission meeting, City staff met with Miami-Dade County on December 15, 2008 to discuss the intersection and the proposed roadway configuration received preliminary approval. At the January 21, 2009 Neighborhoods and Community Affairs Committee meeting, a motion was made to approve the proposed cross-section (see Attachment 4, Proposed Cross-section for 16<sup>th</sup> Street and Alton Road). While the removal of parking spaces is generally of concern anywhere in the City, the intersection configuration recommended by city and county staff addresses a good solution for both bicycle use and safety and for vehicle movements. As such, the trade off of parking spaces in this instance is justified.

#### **CONCLUSION:**

The Administration recommends that the Mayor and City Commission adopt and approve a

roadway configuration for 16<sup>th</sup> Street from Alton Road to Lenox Court that consists of no on-street parking on the north side, on-street parking on the south side, two travel lanes, a left turn lane, and bike lanes. This street cross section best supports the approved BODR for the 16<sup>th</sup> Street Operational Improvement and Enhancement project goals to improve the safety of the corridor for bicyclists and pedestrians and to enhance the quality of life for local residents and visitors.

Attachments:

1. Proposed BODR Cross-sections for 16<sup>th</sup> Street
2. PBSJ Study
3. 16<sup>th</sup> St. and Alton Rd. Bicycle Counts
4. Proposed Cross-section for 16<sup>th</sup> Street and Alton Road

JMG/RCM/FX/XF/CB

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RESOLUTION NO. \_\_\_\_\_

**A RESOLUTION OF THE MAYOR AND CITY COMMISSION OF THE CITY OF MIAMI BEACH, FLORIDA, APPROVING A ROADWAY CONFIGURATION FOR 16<sup>TH</sup> STREET FROM ALTON ROAD TO LENOX COURT THAT CONSISTS OF NO PARKING ON THE NORTH SIDE, PARKING ON THE SOUTH SIDE, TWO TRAVEL LANES, A LEFT TURN LANE, AND BIKE LANES, WHICH BEST SUPPORTS THE GOALS ESTABLISHED IN THE APPROVED 16<sup>TH</sup> STREET OPERATIONAL IMPROVEMENT AND ENHANCEMENT PROJECT BASIS OF DESIGN REPORT AND WHICH WAS PRESENTED AT THE NEIGHBORHOODS/COMMUNITY AFFAIRS COMMITTEE ON JANUARY 21, 2009.**

**WHEREAS**, a Basis of Design Report (BODR) was prepared for the 16<sup>th</sup> Street Operational Improvements and Enhancement project and subsequently reviewed and approved by the Commission on September 5, 2007; and

**WHEREAS**, as part of the approved BODR some of the site design recommendations to create a more pedestrian-friendly environment included a street cross section consisting of a two 10-foot travel lanes, two 5-foot bike lanes, two 8-foot on-street parking lanes, two 12-foot sidewalks in the commercial zone and 6- to 8-foot, variable-width sidewalks in the residential zone, with the planting areas next to private properties varying in width; and

**WHEREAS**, the development of the BODR included an intensive public involvement process with substantial public input and almost every stakeholder group preferred bike lanes; and

**WHEREAS**, in September 2007, the Public Works Department striped and signed bike lanes on 16<sup>th</sup> Street between Bay Road and Washington Avenue and this required the removal of a left turn lane on 16<sup>th</sup> Street approaching Alton Road westbound; and

**WHEREAS**, after the implementation of the bike lanes, residents complained to elected officials and City staff that the elimination of the left turn lane resulted in a significant back-up of vehicles, and City staff was directed by the Office of the Mayor and Commissioners to address this issue; and

**WHEREAS**, the City retained the services of PBS&J to perform a qualitative analysis of the operational conditions of the existing intersection with bike lanes and the results of the study concluded that a queue on the westbound direction was caused by left turn vehicles blocking the westbound through movement; and

**WHEREAS**, an option to improve this condition would be to introduce a left turn lane on 16<sup>th</sup> Street at Alton Road; however doing so would require either the elimination of the bike lane or elimination of the on-street parking on the north side of 16<sup>th</sup> Street between Alton Road and Lenox Court; and

**WHEREAS**, at the November 24, 2008 Neighborhoods/Community Affairs Committee meeting, a motion was made to remove the five (5) existing parking spaces on the north side of 16<sup>th</sup> Street from Alton Road to Lenox Court to allow sufficient space for

both the bike lane and a dedicated left turn lane and at the January 21, 2009 Neighborhoods/ Community Affairs Committee meeting, a motion was made to approve a proposed cross-section of no parking on the north side, parking on the south side, two travel lanes, a left turn lane, and bike lanes; and

**WHEREAS**, a relatively high number of bicyclists utilize 16<sup>th</sup> Street, since it provides directness and connectivity to bicycle traffic generators, and the existing bike lanes provide a safer environment for these bicyclists, since the bike lanes minimize potential conflicts between them and motorized vehicles either parallel parked on 16<sup>th</sup> Street or traveling through the intersection of 16<sup>th</sup> Street at Alton; and

**WHEREAS**, the City Administration would recommend that the Mayor and City Commission approve a roadway configuration for 16<sup>th</sup> Street from Alton Road to Lenox Court that consists of no parking on the north side, parking on the south side, two travel lanes, a left turn lane, and bike lanes, which best supports the approved BODR for the 16<sup>th</sup> Street Operational Improvement and Enhancement project goals and which was presented at the Neighborhoods/Community Affairs Committee on January 21, 2009.

**NOW, THEREFORE, BE IT DULY RESOLVED BY THE MAYOR AND THE CITY COMMISSION OF THE CITY OF MIAMI BEACH, FLORIDA**, that the Mayor and City Commission hereby approve a roadway configuration for 16<sup>th</sup> Street from Alton Road to Lenox Court that consists of no parking on the north side, parking on the south side, two travel lanes, a left turn lane, and bike lanes, which best supports the goals established in the approved 16<sup>th</sup> Street Operational Improvements and Enhancement Project Basis of Design Report and which was presented at the Neighborhoods/Community Affairs Committee on January 21, 2009.

**PASSED and ADOPTED** this \_\_\_\_ day of \_\_\_\_\_, 2009.

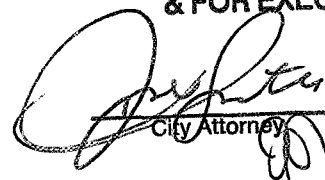
**ATTEST:**

\_\_\_\_\_  
**MAYOR**

\_\_\_\_\_  
**CITY CLERK**

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**APPROVED AS TO  
FORM & LANGUAGE  
& FOR EXECUTION**

  
\_\_\_\_\_  
City Attorney

2/19/09  
\_\_\_\_\_  
Date

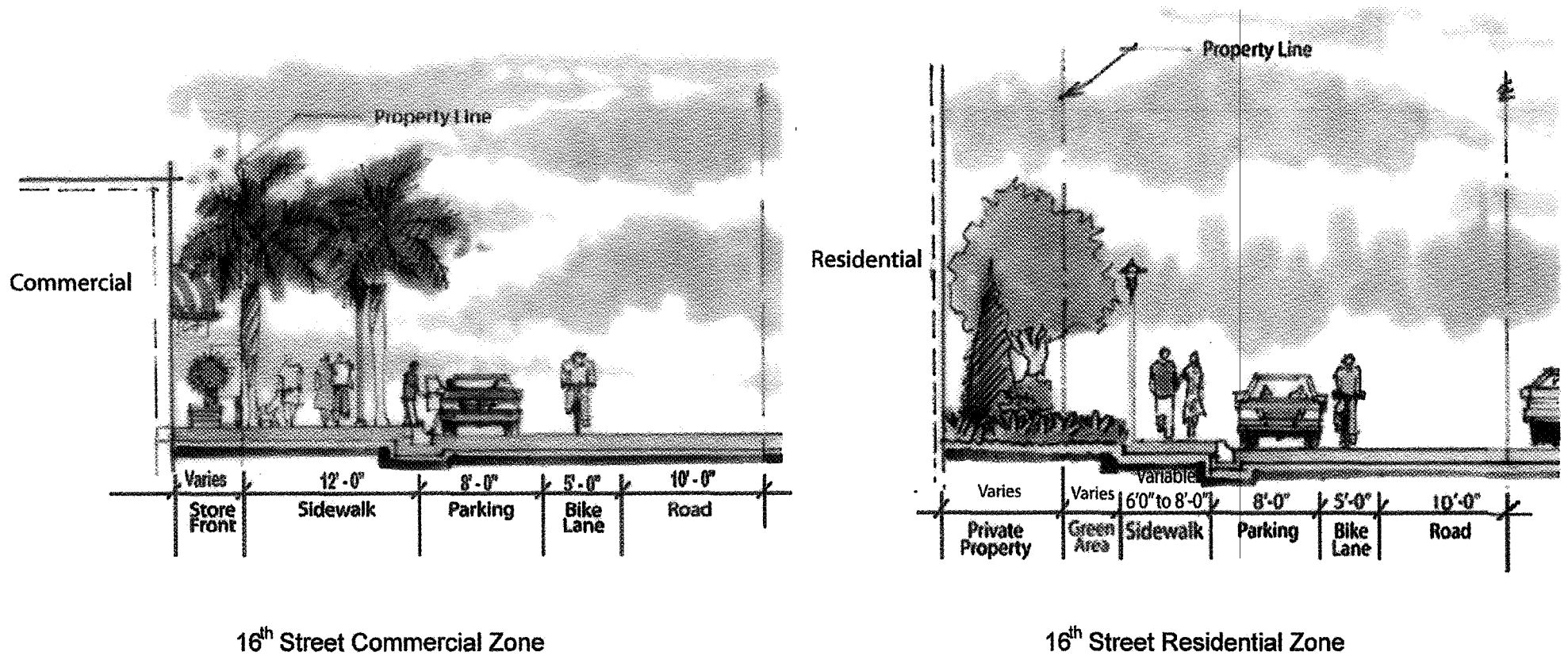


Figure 2 - 4  
 Revised Concept Plan Typical Section  
 16th Street Phase I - Basis of Design Report  
 City of Miami Beach, Florida





MEMORANDUM

**To:** Xavier Falconi, P.E., Transportation Manager, City of Miami Beach  
**From:** Sanhita Lahiri, P.E., PTOE  
**Cc:** Rafiq Alqasem, P.E., PTOE  
Christine Leduc, Transportation Coordinator, City of Miami Beach  
**Date:** June 26, 2008  
**Re:** Intersection of 16<sup>th</sup> Street and Alton Road – Left turn storage lanes on the East and Westbound direction.

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PBS&J has performed a field review of the intersection of 16<sup>th</sup> Street and Alton Road, and have also reviewed the BODR SYNCHRO model of this intersection, provided by the City. Following are the summary and recommendations:

- It was identified in the meeting with the City of Miami Beach and PBS&J on May 6, 2008 that the methodology to be adopted for the study would be –
  - (a) Modify the 2007 PM peak BODR SYNCHRO model (obtained from the City) for the intersection 16<sup>th</sup> Street and Alton Road, to test a split phase operation for the Eastbound and Westbound movements. It was agreed that no other parameters in the model would be changed so that the delay before and after may be compared.
  - (b) Depending on the delay comparison, a further course of action will be decided, including the possibility of full traffic impact study.
- Review of the 2007 PM peak BODR SYNCHRO model showed that the intersection was evaluated with an Eastbound left turn storage lane of 80ft and a Westbound left turn storage lane of 110ft. The existing operating conditions are however much more constrained with no left turn storage lanes on the eastbound and westbound direction. The model was modified and the left turn lanes were eliminated and split phase introduced. Table 1 below shows that removing the left turn storage lane, cause significantly more delay to both the approaches and introduction of split phase on the Eastbound and Westbound direction further exacerbate the condition.

**Table 1 – Summary of Approach Delays Obtained from SYNCHRO Model for 16<sup>th</sup> Street and Alton Road**

Approach	2007 PM PEAK BODR MODEL APPROACH DELAY (s)		2007 PM PEAK MODEL WITH SPLIT PHASE FOR EASTBOUND AND WESTBOUND MOVEMENTS APPROACH DELAY (s)	
	Obtained from City of Miami Beach – Including Eastbound and Westbound Left turn Storage lanes	Modified by PBS&J – Excluding Eastbound and Westbound Left turn Storage lanes	Modified by PBS&J – Including Eastbound and Westbound Left turn Storage lanes	Modified by PBS&J – Excluding Eastbound and Westbound Left turn Storage lanes
Eastbound	46.7	195.8	74.2	362.5
Westbound	33.4	34.1	66.0	84.5

- The BODR reports the PM peak hour to be between 5:00PM and 6:00PM, and field review was done on May 20, 2008 to observe and assess the existing conditions including geometric and operational during the above mentioned time period.

It was observed that the existing Eastbound and Westbound vehicular movement at the intersection of 16<sup>th</sup> Street and Alton Road has a shared operation with only 1 lane sharing the Left, Through and Right turn movements. The roadway at this location also has bike lanes on both sides of the roadways.

The signal operation shows the Eastbound and Westbound left turn movements operating on a permissive phase. Queues on both directions were observed and sample counts were taken for 15 consecutive signal cycles (130sec per cycle). The field observation clearly shows no left over queues on the Eastbound direction and up to 14 cars on the Westbound direction. This does not match with the queues observed in the 2007 PM peak BODR SYNCHRO model (the model shows total 463veh on the Eastbound and 122veh on the Westbound direction). Table 2 below shows the left over queue data collected in the field.

**Table 2 – Sample Queue Counts Observed on May 20, 2008 at the intersection of 16<sup>th</sup> Street and Alton Road**

Sample Queue Counts Signal Cycle	Left Over Queue from Previous Cycle (veh)	
	Eastbound	Westbound
1st Cycle	0	7
2nd Cycle	0	0
3rd Cycle	0	0
4th Cycle	0	0
5th Cycle	0	0
6th Cycle	0	1
7th Cycle	0	7
8th Cycle	0	4
9th Cycle	0	9
10th Cycle	0	14
11th Cycle	0	9
12th Cycle	0	0
13th Cycle	0	0
14th Cycle	0	3
15th Cycle	0	4

It was also observed that the right turning vehicles on both the directions used the bike lanes to turn, forcing bikers to use the sidewalk, a significant number of bikers were observed to this in the time period observed.

The queue on the westbound direction was observed to be caused by the left turn vehicles blocking the westbound through movement. As mentioned earlier the left turn movement operates on a permissive phase and has to wait for adequate gap from opposing traffic to cross the intersection.

- The qualitative field assessment shows that westbound movement has queues, which spill back to the intersection on the east of Alton Road. This condition could be improved by introducing a left turn lane. The physical geometry of the roadway at this point of time does not offer any other option than removing the bike lane and installing a left turn lane. However it may be noted that the removal of a bike lane from a particular section of roadway with continuous bike lanes, may not be safe as it would force the bikers on the sidewalk in that section.

Miami Beach BODR  
Lanes, Volumes, Timings

10:16 St. & Alton Rd  
2007 PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	16	12	10	16	12	10	12	12	10	12	10
Storage Length (ft)	80		0	110		0	120		0	140		75
Storage Lanes	1		0	1		0	1		0	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.912			0.955			0.992				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1637	0	1652	1714	0	1652	3511	0	1652	3274	1478
Flt Permitted	0.652			0.402			0.274			0.199		
Satd. Flow (perm)	1134	1637	0	699	1714	0	476	3511	0	346	3274	1478
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		56			17			7				32
Headway Factor	1.09	1.05	1.00	1.09	1.05	1.00	1.09	1.00	1.00	1.09	1.11	1.09
Link Speed (mph)		30			30			30				30
Link Distance (ft)		407			196			276				591
Travel Time (s)		9.3			4.5			6.3				13.4
Volume (vph)	215	102	146	22	70	30	101	886	48	159	895	49
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)		10			10							10
Adj. Flow (vph)	234	111	159	24	76	33	110	963	52	173	973	53
Lane Group Flow (vph)	234	270	0	24	109	0	110	1015	0	173	973	53
Turn Type	Perm			Perm			Perm			pm+pt		Perm
Protected Phases		4			8			2		1		6
Permitted Phases	4			8			2			6		6
Detector Phases	4	4		8	8		2	2		1	6	6
Minimum Initial (s)	27.0	27.0		27.0	27.0		30.0	30.0		5.0	30.0	30.0
Minimum Split (s)	38.0	38.0		38.0	38.0		79.0	79.0		8.0	79.0	79.0
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	79.0	79.0	0.0	9.0	88.0	88.0
Total Split (%)	32.3%	32.3%	0.0%	32.3%	32.3%	0.0%	60.8%	60.8%	0.0%	6.9%	67.7%	67.7%
Maximum Green (s)	37.0	37.0		37.0	37.0		74.0	74.0		6.0	83.0	83.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		0.0	1.0	1.0
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max		None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		56.0	56.0		56.0	56.0	56.0
Flash Dont Walk (s)	26.0	26.0		26.0	26.0		18.0	18.0		18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)	32.7	32.7		32.7	32.7		78.5	78.5		89.2	89.2	89.2
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.60	0.60		0.69	0.69	0.69
v/c Ratio	0.82	0.59		0.14	0.24		0.38	0.48		0.57	0.43	0.05
Uniform Delay, d1	45.8	33.3		37.6	32.4		13.3	14.3		7.1	9.1	2.6
Control Delay	57.8	36.7		37.3	32.5		19.2	15.6		16.6	10.3	4.1

5/22/2008  
NCL  
PBS&J Inc.

Obtained from City of Miami Beach

Miami Beach BODR  
Lanes, Volumes, Timings

10: 16 St. & Alton Rd  
2007 PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.4		0.0	0.0		0.0	0.0		0.1	0.0	0.0
Total Delay	57.8	37.1		37.3	32.5		19.2	15.7		16.7	10.3	4.1
LOS	E	D		D	C		B	B		B	B	A
Approach Delay		46.7			33.4			16.0			11.0	
Approach LOS		D			C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 51 (39%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 125

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 20.0

Intersection LOS: B

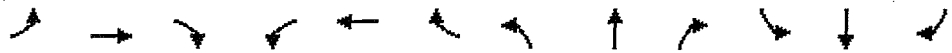
Intersection Capacity Utilization: 82.5%

ICU Level of Service: E

Analysis Period (min): 15

Splits and Phases: 10: 16 St. & Alton Rd

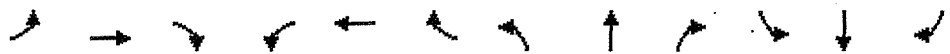
9s	79s	42s	42s
88s	42s	42s	42s



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕		↗	↕	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	16	12	10	16	12	10	12	12	10	12	10
Storage Length (ft)	0		0	0		0	120		0	140		75
Storage Lanes	0		0	0		0	1		0	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.957			0.967			0.992				0.850
Flt Protected		0.977			0.991			0.950			0.950	
Satd. Flow (prot)	0	1678	0	0	1720	0	1652	3511	0	1652	3274	1478
Flt Permitted		0.738			0.882			0.274			0.199	
Satd. Flow (perm)	0	1267	0	0	1530	0	476	3511	0	346	3274	1478
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			13			7				32
Headway Factor	1.09	1.05	1.00	1.09	1.05	1.00	1.09	1.00	1.00	1.09	1.11	1.09
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		407			196			276			591	
Travel Time (s)		9.3			4.5			6.3			13.4	
Volume (vph)	215	102	146	22	70	30	101	886	48	159	895	49
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)		10			10						10	
Adj. Flow (vph)	234	111	159	24	76	33	110	963	52	173	973	53
Lane Group Flow (vph)	0	504	0	0	133	0	110	1015	0	173	973	53
Turn Type	Perm		Perm			Perm			pm+pt		Perm	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		6
Detector Phases	4	4		8	8		2	2		1	6	6
Minimum Initial (s)	27.0	27.0		27.0	27.0		30.0	30.0		5.0	30.0	30.0
Minimum Split (s)	38.0	38.0		38.0	38.0		79.0	79.0		8.0	79.0	79.0
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	79.0	79.0	0.0	9.0	88.0	88.0
Total Split (%)	32.3%	32.3%	0.0%	32.3%	32.3%	0.0%	60.8%	60.8%	0.0%	6.9%	67.7%	67.7%
Maximum Green (s)	37.0	37.0		37.0	37.0		74.0	74.0		6.0	83.0	83.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		0.0	1.0	1.0
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max		None	C-Max	C-Max
Walk Time (s)	7.0	7.0		7.0	7.0		56.0	56.0		56.0	56.0	56.0
Flash Dont Walk (s)	26.0	26.0		26.0	26.0		18.0	18.0		18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	0
Act Effct Green (s)		38.0			38.0		75.0	75.0		84.0	84.0	84.0
Actuated g/C Ratio		0.29			0.29		0.58	0.58		0.65	0.65	0.65
v/c Ratio		1.32			0.29		0.40	0.50		0.63	0.46	0.05
Uniform Delay, d1		43.8			31.9		15.1	16.2		9.1	11.6	3.3
Control Delay		195.8			34.1		20.6	17.3		21.3	12.4	4.3

Miami Beach BODR\_Revised With Existing Geometry  
Lanes, Volumes, Timings

10: 16 St. & Alton Rd  
2007 PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0		0.0	0.1		0.1	0.0	0.0
Total Delay		195.8			34.1		20.6	17.3		21.4	12.4	4.3
LOS		F			C		C	B		C	B	A
Approach Delay		195.8			34.1			17.7			13.4	
Approach LOS		F			C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 51 (39%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 145

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 47.0

Intersection LOS: D

Intersection Capacity Utilization: 92.9%

IOU Level of Service: F

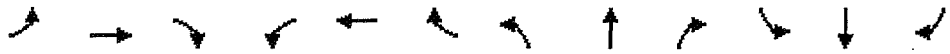
Analysis Period (min) 15

Splits and Phases: 10: 16 St. & Alton Rd

9%	79%	42%	42%
88%	88%	42%	42%

Miami Beach BODR\_ Revised With Split Phase  
Lanes, Volumes, Timings

10: 16 St. & Alton Rd  
2007 PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	16	12	10	16	12	10	12	12	10	12	10
Storage Length (ft)	80		0	110		0	120		0	140		75
Storage Lanes	1		0	1		0	1		0	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.912			0.955			0.992				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1637	0	1652	1714	0	1652	3511	0	1652	3274	1478
Flt Permitted	0.950			0.950			0.274			0.199		
Satd. Flow (perm)	1652	1637	0	1652	1714	0	476	3511	0	346	3274	1478
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		48			13			7				32
Headway Factor	1.09	1.05	1.00	1.09	1.05	1.00	1.09	1.00	1.00	1.09	1.11	1.09
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		407			953			276			591	
Travel Time (s)		9.3			21.7			6.3			13.4	
Volume (vph)	215	102	146	22	70	30	101	886	48	159	895	49
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)		10			10						10	
Adj. Flow (vph)	234	111	159	24	76	33	110	963	52	173	973	53
Lane Group Flow (vph)	234	270	0	24	109	0	110	1015	0	173	973	53
Turn Type	Split			Split			Perm			pm+pt		Perm
Protected Phases	4	4		8	8			2		1	6	
Permitted Phases							2			6		6
Detector Phases	4	4		8	8		2	2		1	6	6
Minimum Initial (s)	5.0	5.0		5.0	5.0		30.0	30.0		5.0	30.0	30.0
Minimum Split (s)	21.0	21.0		10.0	10.0		79.0	79.0		8.0	79.0	79.0
Total Split (s)	26.0	26.0	0.0	16.0	16.0	0.0	79.0	79.0	0.0	9.0	88.0	88.0
Total Split (%)	20.0%	20.0%	0.0%	12.3%	12.3%	0.0%	60.8%	60.8%	0.0%	6.9%	67.7%	67.7%
Maximum Green (s)	21.0	21.0		11.0	11.0		74.0	74.0		6.0	83.0	83.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		0.0	1.0	1.0
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max		None	C-Max	C-Max
Walk Time (s)	5.0	5.0					56.0	56.0			56.0	56.0
Flash Dont Walk (s)	11.0	11.0					18.0	18.0			18.0	18.0
Pedestrian Calls (#/hr)	0	0					0	0			0	0
Act Effct Green (s)	21.1	21.1		11.2	11.2		76.3	76.3		85.6	85.6	85.6
Actuated g/C Ratio	0.16	0.16		0.09	0.09		0.59	0.59		0.66	0.66	0.66
v/c Ratio	0.87	0.88		0.17	0.68		0.39	0.49		0.61	0.45	0.05
Uniform Delay, d1	53.0	43.5		55.0	50.7		14.5	15.5		8.5	10.8	3.0
Control Delay	77.8	67.7		57.2	68.0		20.2	16.7		20.0	11.9	4.3

5/22/2008  
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Miami Beach BODR\_ Revised With Split Phase  
Lanes, Volumes, Timings

10: 16 St. & Alton Rd  
2007 PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NBT	NBR	SBL	SBT	SBR
Queue Delay	2.0	1.6		0.0	0.0		0.0	0.1		0.1	0.0	0.0
Total Delay	79.7	69.3		57.2	68.0		20.2	16.8		20.1	11.9	4.3
LOS	E	E		E	E		C	B		C	B	A
Approach Delay		74.2			66.0			17.1			12.7	
Approach LOS		E			E			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 51 (39%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 27.3

Intersection LOS: C

Intersection Capacity Utilization: 78.6%

ICU Level of Service: D

Analysis Period (min) 15

Splits and Phases: 10: 16 St. & Alton Rd

9s	79s	26s	16s
80s			

Miami Beach BODR\_ Revised With Existing Geometry and Split Phase 10: 16 St. & Alton Rd  
Lanes, Volumes, Timings 2007 PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↔			↑	↕	↕	↑	↕	↕
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	16	12	10	16	12	10	12	12	10	12	10
Storage Length (ft)	0		0	0		0	120		0	140		75
Storage Lanes	0		0	0		0	1		0	1		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	50
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.957			0.967			0.992				0.850
Flt Protected		0.977			0.991		0.950			0.950		
Satd. Flow (prot)	0	1678	0	0	1720	0	1652	3511	0	1652	3274	1478
Flt Permitted		0.977			0.991		0.274			0.199		
Satd. Flow (perm)	0	1678	0	0	1720	0	476	3511	0	346	3274	1478
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			10			7				32
Headway Factor	1.09	1.05	1.00	1.09	1.05	1.00	1.09	1.00	1.00	1.09	1.11	1.09
Link Speed (mph)		30			30			30				30
Link Distance (ft)		407			953			276				591
Travel Time (s)		9.3			21.7			6.3				13.4
Volume (vph)	215	102	146	22	70	30	101	886	48	159	895	49
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)		10			10						10	
Adj. Flow (vph)	234	111	159	24	76	33	110	963	52	173	973	53
Lane Group Flow (vph)	0	504	0	0	133	0	110	1015	0	173	973	53
Turn Type	Split			Split			Perm			pm+pt		Perm
Protected Phases	4	4		8	8			2		1	6	
Permitted Phases							2			6		6
Detector Phases	4	4		8	8		2	2		1	6	6
Minimum Initial (s)	5.0	5.0		5.0	5.0		30.0	30.0		5.0	30.0	30.0
Minimum Split (s)	21.0	21.0		10.0	10.0		79.0	79.0		8.0	79.0	79.0
Total Split (s)	26.0	26.0	0.0	16.0	16.0	0.0	79.0	79.0	0.0	9.0	88.0	88.0
Total Split (%)	20.0%	20.0%	0.0%	12.3%	12.3%	0.0%	60.8%	60.8%	0.0%	6.9%	67.7%	67.7%
Maximum Green (s)	21.0	21.0		11.0	11.0		74.0	74.0		6.0	83.0	83.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		0.0	1.0	1.0
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		C-Max	C-Max		None	C-Max	C-Max
Walk Time (s)	5.0	5.0					56.0	56.0		56.0	56.0	
Flash Dont Walk (s)	11.0	11.0					18.0	18.0		18.0	18.0	
Pedestrian Calls (#/hr)	0	0					0	0		0	0	0
Act Effct Green (s)		22.0			11.7		75.0	75.0		84.2	84.2	84.2
Actuated g/C Ratio		0.17			0.09		0.58	0.58		0.65	0.65	0.65
v/c Ratio		1.70			0.81		0.40	0.50		0.62	0.46	0.05
Uniform Delay, d1		51.2			53.5		15.1	16.2		9.0	11.5	3.2
Control Delay		362.5			84.5		20.6	17.3		20.9	12.4	4.3

5/22/2008  
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Miami Beach BODR\_Revised With Existing Geometry and Split Phase 10: 16 St. & Alton Rd  
Lanes, Volumes, Timings 2007 PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0		0.0	0.1		0.1	0.0	0.0
Total Delay		362.5			84.5		20.6	17.3		21.0	12.4	4.3
LOS		F			F		C	B		C	B	A
Approach Delay		362.5			84.5			17.7			13.2	
Approach LOS		F			F			B			B	

**Intersection Summary**

Area Type: Other  
 Cycle Length: 130  
 Actuated Cycle Length: 130  
 Offset: 51 (39%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green  
 Natural Cycle: 150  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 1.70  
 Intersection Signal Delay: 77.6  
 Intersection LOS: E  
 Intersection Capacity Utilization: 92.9%  
 ICU Level of Service: F  
 Analysis Period (min) 15

Splits and Phases: 10: 16 St. & Alton Rd

9 s	79 s	26 s	16 s
88 s			

**CITY OF MIAMI BEACH  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION**

Intersection: 16th ST & Alton Road

11/18/2008

Time		4:00-4:15 PM	4:15-4:30 PM	4:30-4:45 PM	4:45-5:00 PM	Total
Total Observed		44	26	28	26	124
Mode	Bicycle					
Direction	from 16 ST Left on to Alton Rd. South	4	0	2	8	14
	from 16 ST Right on to Alton Rd. North	3	4	1	1	9
	from 16 ST across Alton Rd. Westbound	2	2	4	2	10
	from 16 ST Left on to Alton Rd. North	1	1	0	1	3
	from 16 ST Right on to Alton Rd. South	1	0	0	1	2
	from 16 ST across Alton Rd. Eastbound	6	5	5	4	20
	from Alton Rd Left on to 16 ST East	11	0	5	1	17
	from Alton Rd Right on to 16 ST West	1	0	0	0	1
	from Alton Rd across 16 ST Southbound	6	5	6	2	19
	from Alton Rd Left on to 16 ST West	1	0	0	1	2
	from Alton Rd Right on to 16 ST East	0	0	1	0	1
	from Alton Rd across 16 ST Northbound	8	9	4	5	26

Attachment 3

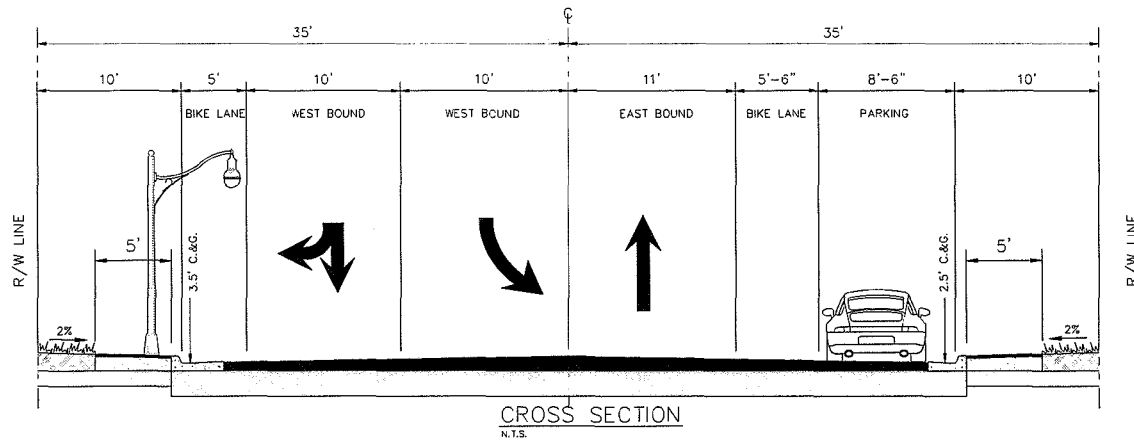
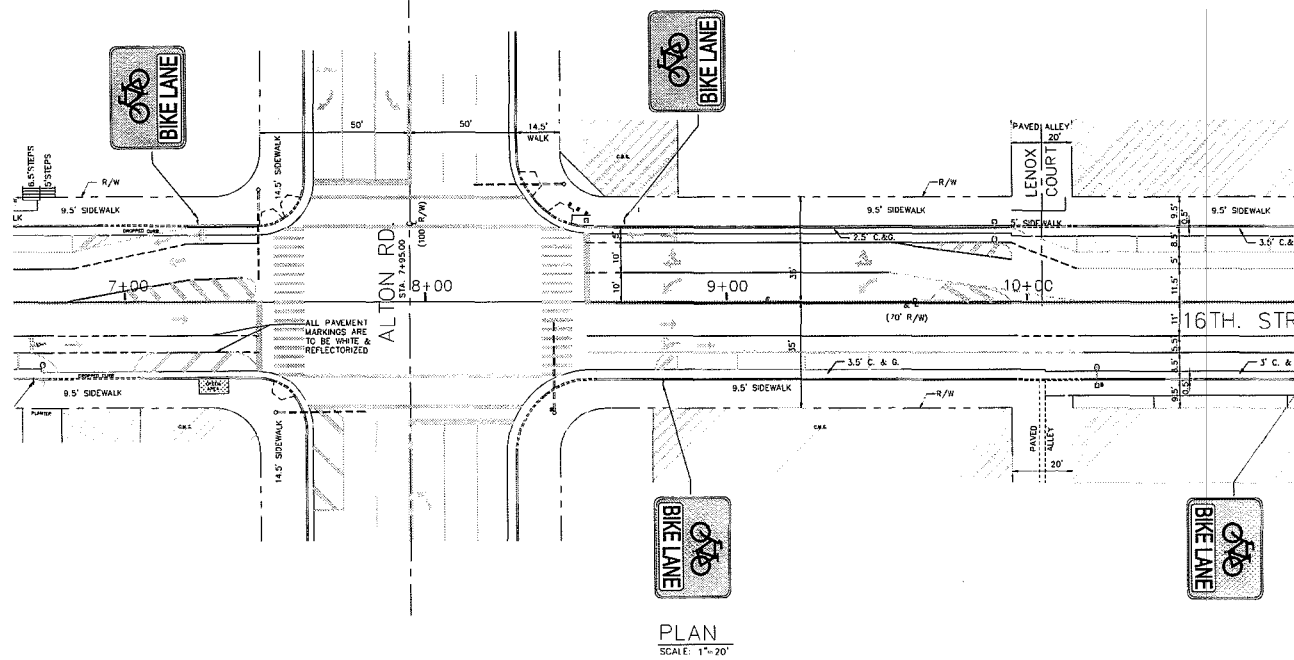
**CITY OF MIAMI BEACH  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION**

Intersection: 16th ST & Alton Road

11/18/2008

Time		5:00-5:15 PM	5:15-5:30 PM	5:30-5:45 PM	5:45-6:00 PM	Total
Total Observed		21	19	20	12	72
Mode	Bicycle					
Direction	from 16 ST Left on to Alton Rd. South	2	2	2	0	6
	from 16 ST Right on to Alton Rd. North	1	1	2	2	6
	from 16 ST across Alton Rd. Westbound	3	3	1	3	10
	from 16 ST Left on to Alton Rd. North	1	0	0	1	2
	from 16 ST Right on to Alton Rd. South	1	0	1	0	2
	from 16 ST across Alton Rd. Eastbound	4	1	1	1	7
	from Alton Rd Left on to 16 ST East	0	3	2	1	6
	from Alton Rd Right on to 16 ST West	0	2	1	0	3
	from Alton Rd across 16 ST Southbound	2	4	2	0	8
	from Alton Rd Left on to 16 ST West	3	0	1	1	5
	from Alton Rd Right on to 16 ST East	1	1	1	0	3
	from Alton Rd across 16 ST Northbound	3	2	6	3	14

# Attachment 4



**CITY OF MIAMI BEACH, FLORIDA**  
PUBLIC WORKS DEPARTMENT  
1700 CONVENTION CENTER DRIVE, MIAMI BEACH, FL 33139

**TITLE: 16th. STREET STRIPING PROJECT**  
**ALTON ROAD TO LENOX AVENUE**

**CITY MANAGER:** JORGE GONZALEZ  
**DIRECTOR:** FRED H. BECKMANN  
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**ENGINEER OF RECORDS:** ARSHAD VIDAR  
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**CHECKER:** M.A.  
**SCALE:** AS SHOWN

NO.	DATE	REVISION	APPRO. BY
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**File location:** F:\WORK\ALL\CAD-DWG\PROJECTS\TRAFFIC\BIKE PATH\16TH STREET.DWG  
**Field Book:** 1164  
**Date:** 11/05/2009  
**Page:** 37-39  
**Job Order:** 16-26  
**Sheet:** 4 of 13  
**Drawing:** 16TH STREET

